

NYONA LAKE  
Fulton County  
2010 Fish Management Report

Jeremy Price, Fisheries Biologist  
Tom Bacula, Naturalist Aide



Fisheries Section  
Indiana Department of Natural Resources  
Division of Fish and Wildlife  
I.G.C.-South, Room W273  
402 W. Washington Street  
Indianapolis, IN 46204

## EXECUTIVE SUMMARY

- Nyona Lake is a 104-acre natural lake in Fulton County, Indiana. Nyona Lake has a maximum depth of 32 ft and an average depth of 13 ft.
- A standard fisheries survey was conducted from July 5 to 8, 2010. Fish were collected using three sampling gears at standard locations: pulsed DC, shoreline night electrofishing at four 15-min transects, four standard gill nets, and four trap nets were fished overnight.
- A total of 647 fish representing 15 species and one hybrid was collected for an estimated total weight of 319.9 lbs. The most abundant species by number were bluegill (43%), largemouth bass (32%), and gizzard shad (7%). By weight the most abundant species were largemouth bass (55%), spotted gar (12%), and bluegill (10%).
- There were 276 bluegills collected that weighed an estimated 31.7 lbs. Bluegills ranged in length from 1.8 to 8.2 in and 29% of fish collected were considered harvestable ( $TL \geq 6.0$  in). Bluegill PSD was 35.
- Largemouth bass were the second most abundant fish collected (205 fish) and ranked first by weight (174.3 lbs). Largemouth ranged in length from 2.3 to 19.3 in. Bass PSD was 60 and RSD-14 was 23. There were 37 legal largemouth bass collected ( $TL \geq 14.0$  in). Bass ages ranged from 1 to 8 and one 11-year-old fish was identified.
- Only 42 gizzard shad were collected that weighed an estimated 30.4 lbs. Shad ranged from 1.4 to 16.5 in, and the majority (76%) of fish were between 13.0 and 16.5 in.
- Thirty-four yellow perch were collected that weighed an estimated 4.1 lbs. Perch ranged in length from 4.2 to 9.5 in. Ages identified ranged from 1 to 5.
- A total of 27 redear sunfish were collected that weighed an estimated 7.5 lbs. These fish ranged in length from 2.8 to 9.2 in, and 44% of redear were larger than 7.0 in.
- Other catches include collecting seven black crappie with lengths ranging from 4.4 to 10.5 in. One hybrid striped bass was collected that was 21.2 in and age 3.
- The aquatic vegetation survey was conducted on July 21, 2010 and six species of submersed vegetation were identified. Coontail was the most common species collected at 60% of sites. Eurasian watermilfoil and eelgrass were collected at 44% and 36% of sites, respectively. There were also seven emergent species observed.
- Overall, the standard survey at Nyona Lake indicated that excellent fishing opportunities are present for largemouth bass, panfish, and hybrid striped bass. Management recommendations include continuation of hybrid striped bass stocking at a rate of 10/acre (1,040 total) and conducting a creel survey in 2012.

## TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY .....	i
TABLE OF CONTENTS.....	ii
LIST OF TABLES .....	iii
LIST OF FIGURES .....	iv
INTRODUCTION .....	1
METHODS .....	1
RESULTS .....	2
Standard Fisheries Survey.....	2
Submersed Aquatic Vegetation Survey .....	3
DISCUSSION .....	3
RECOMMENDATIONS.....	6
LITERATURE CITED .....	7
APPENDIX.....	13

## LIST OF TABLES

	Page
Table 1. Species stocked into Nyona Lake, Fulton County, Indiana. ....	8
Table 2. Species relative abundance by percent number and weight (lbs.) with sampling effort for fisheries surveys from 1964 to 2010 at Nyona Lake, Fulton County, Indiana. ....	9
Table 3. Largemouth bass electrofishing catch rates by size category from the 2010 standard fishery survey and two previous standard fishery surveys at Nyona Lake.....	10
Table 4. Population size structure indices for largemouth bass (LMB) and bluegill (BLG) from the from the electrofishing sample of the 2010 standard fishery survey and two previous standard fishery surveys at Nyona Lake.....	10
Table 5. Bluegill electrofishing catch rates by size category from the 2010 standard fishery survey and two previous standard fishery surveys at Nyona Lake.....	10

## LIST OF FIGURES

Figure 1. Catch-per-unit-effort from electrofishing and gill net catch shad and relative abundance for gizzard from standard fishery surveys of Nyona Lake from 1987 to 2010.....	11
---	----

## INTRODUCTION

Nyona Lake is a 104-acre natural lake in Fulton County, Indiana. The lake consists of two basins connected by a 40-foot wide channel. Nyona Lake has a maximum depth of 32 ft and an average depth of 13 ft. A state owned public access is located on the southwest shore.

The first fisheries survey at Nyona Lake was in 1964. Surveys in the 1960's and 1970's were dominated by high abundance of gizzard shad. Largemouth bass were stocked following a gizzard shad selective in 1971 (Table 1). The selective briefly reduced shad abundance, but shad recovered and returned as the dominant species until the 1998 standard survey (Table 2). In an attempt to add additional predators 550 northern pike were stocked in 1986. A survey in 1987 was used to evaluate the pike stocking and only two pike were collected. In 1990, a hybrid striped bass stocking program was started to provide additional angling opportunities and provide predation pressure on the abundant gizzard shad population. Hybrid striped bass stockings have been evaluated in 1990, 1991, 2005, 2007, and 2009. Overall, varying numbers of hybrid striped bass have been collected, but there has been consistent survival of stocked fish. No formal criteria have been established to rate stocking success.

The most recent standard fisheries survey was conducted in 1998 (Robertson 1999). There were 295 fish collected representing 12 species and one hybrid that collectively weighed an estimated 206.9 lbs. Largemouth bass was the most abundant species collected by number (30%) followed by bluegill (20%), redear sunfish (16%), gizzard shad (10%), and yellow perch (7%). By weight the most abundant species was largemouth bass (35%), redear sunfish (12%), gizzard shad (11%), spotted gar (8%), and brown bullhead (8%). Overall, Nyona Lake was deemed to be providing good fishing opportunities for largemouth bass, bluegill, and redear sunfish. Opportunities to catch quality sized yellow perch and hybrid striped bass were also noted.

The goal of the 2010 fisheries survey was to evaluate the fish community at Nyona Lake under work plan 300FWF10D41621.

## METHODS

A standard fisheries survey was conducted from July 5 to 8, 2010. Physical and chemical characteristics were collected in the deepest area of the lake according to the Division of Fish and Wildlife (DFW) sampling guidelines (Shipman et al. 2001). Aquatic vegetation was

sampled on July 21, 2010 according to the DFW Tier II Aquatic Vegetation Survey Protocol (IDNR 2007).

Fish were collected using three sampling gears. Pulsed DC, shoreline electrofishing was conducted for 1.0 h at night with two dippers. Two trap nets and two standard gill nets were also fished for two nights each. All fish collected were measured to the nearest 0.1 in total length (TL) and a length-weight regression was used to estimate fish weight. Five scale samples were taken per half-inch group (X.0-X.4 for inch group and X.5-X.9 for half-inch group) from all sportfish for age and growth analysis. For largemouth bass, five scale (fish < 12.0 in TL) or fin ray (fish  $\geq$  12.0 in TL) samples were taken per half-inch group for age and growth analysis. Catch per unit effort (CPUE) was calculated for the dominant fish collected as catch divided by effort for each sampling gear. Proportional stock density (PSD) and relative stock density (RSD) was calculated for largemouth bass and bluegill captured via electrofishing (Anderson and Neumann 1996).

## RESULTS

### Standard Fisheries Survey

A total of 647 fish representing 15 species and one hybrid was collected for an estimated total weight of 319.9 lbs. The five most abundant species by number were bluegill (43%), largemouth bass (32%), gizzard shad (7%), spotted gar (5%), and yellow perch (5%). By weight the most abundant species are largemouth bass (55%), spotted gar (12%), bluegill (10%), gizzard shad (10%), and common carp (4%).

There were 276 bluegills collected that weighed an estimated 31.7 lbs. Electrofishing caught the most bluegills (CPUE = 236.0/h) followed by trap nets (8.5/lift) and gill nets (1.5/lift). Bluegills ranged in length from 1.8 to 8.2 in and 29% of fish collected were considered harvestable (TL  $\geq$  6.0 in). Bluegill PSD was 35. Ages 1 through 7 were identified and age-2 accounted for 41% of fish collected. Length at capture for ages 1 to 4 was 2.5 in, 4.1 in, 5.6 in, and 6.5 in, respectively.

Largemouth bass were the second most abundant fish collected (205 fish) and first by weight (174.3 lbs). All bass were collected with electrofishing at a rate of 205.0/h. Collected fish ranged in length from 2.3 to 19.3 in. Bass PSD was 60 and RSD-14 was 23. There were 37 legal largemouth bass collected (TL  $\geq$  14.0 in). Bass ages ranged from 1 to 8 and one 11-year-old fish was identified. Bass reached legal length between ages 4 and 5.

Only 42 gizzard shad were collected that weighed an estimated 30.4 lbs. Electrofishing CPUE was 34.0/h and gill net CPUE was 2.0/lift. No shad were collected in trap nets. Shad ranged from 1.4 to 16.5 in, and the majority (76%) of fish was between 13.0 and 16.5 in.

Thirty-four yellow perch were collected that weighed an estimated 4.1 lbs. Most perch (33 fish) were collected with electrofishing, and the other fish was collected in gill nets. Collected fish ranged in length from 4.2 to 9.5 in. Ages identified ranged from 1 to 5 and 74% of fish were identified as age-2 perch.

A total of 27 redear sunfish was collected that weighed an estimated 7.5 lbs. Most of the fish were collected with electrofishing (CPUE = 25.0/h) followed by trap nets (CPUE = 0.5/h). No redear sunfish were collected in gill nets. Fish ranged in length from 2.8 to 9.2 in and 44% of fish were larger than 7.0 in. Ages ranged from 2 to 7 and 48% of redear sunfish collected were age-2.

Spotted gar were the fourth most abundant species (35 fish) and second most abundant by weight (38.5 lbs). Spotted gar ranged in length from 18.6 to 31.0 in. Electrofishing CPUE was 19.0/h and gill net CPUE was 4.0/lift. Only seven black crappie were collected, but 43% were larger than 10.0 in and ages 6 and 7. One hybrid striped bass was collected that was 21.2 in and age 3.

#### Submersed Aquatic Vegetation Survey

During the Nyona Lake submersed aquatic vegetation survey we collected six species of vegetation. Coontail was the most common species collected at 60% of sites. Eurasian water milfoil and eelgrass were collected at 44% and 36% of sites, respectively. Filamentous algae were collected at 68% of sites. Vegetation was collected down to 9 ft. The secchi disk reading was 4 ft. Mean rake score was 1.46. There were four additional species of submersed aquatic vegetation and seven emergent species vegetation observed.

### DISCUSSION

Substantial changes in the Nyona Lake fishery have occurred, most notably in the bluegill, largemouth bass and gizzard shad populations, since the 1987 survey. Gizzard shad dominated most fishery surveys prior to 1998. In the two standard surveys conducted since relative abundance of gizzard shad has declined precipitously. Relative abundance of shad in the 2010 sample was a mere 26% of the lowest shad abundance recorded between 1970 and 1987



and only 15% of that recorded in the 1987 survey at Nyona (Figure 1). Conversely, the largemouth bass and bluegill populations have surged in response with drastic increases in electrofishing catch rates for stock and quality-size fish and gains in relative abundance of the survey samples from 1998 and 2010. We speculate that two primary factors have synergistically contributed to these changes including improved protection of largemouth bass populations through regulations imposed in the 1990's and enhanced predation pressure on gizzard shad population through the resulting higher largemouth bass densities and stocking of hybrid striped bass that began in 1990.

The foremost factor contributing to the increase in largemouth bass abundance at Nyona is likely to be enhanced bass harvest regulations imposed in 1990 (12-inch minimum size; continuance of a 6 fish bag limit) and 1998 (14-inch minimum size; 5 fish bag limit). From 1987 to 1998 electrofishing catch rates of stock-sized largemouth bass nearly doubled while catch rates for quality-sized bass increased more than fourfold (Table 3). Between 1998 and 2010, the bass population expanded further, again more than doubling the catch of stock-size fish and tripling that of quality-sized fish. Commensurate increases in PSD and RSD-P occurred between 1987 and 1998, thus moving both indices into a range indicative of balance (Table 4). Bass PSD increased again in 2010, however RSD-P fell back below the balanced range. Despite this fact, electrofishing catch rates indicate that there are more legal-sized bass (i.e  $TL \geq 14$  in) in Nyona Lake than have been measured in the two previous surveys while numbers of preferred-size fish have remained stable (Table 3). The quality of bass fishing at Nyona Lake has clearly improved due to the enhanced regulation of harvest.

At the same time as the initial bass protections were being implemented, hybrid striped bass stocking also began at Nyona Lake. Since 1990 stocking rates ranged from 10 to 27 hybrid striped bass per acre (Table 1). In six different years since the initial stocking, production problems resulted in no hybrid striped bass being stocked. Despite the inconsistencies in production, consistent survival of stocked fish has generally maintained a substantial hybrid striper population (Long 2010). Adult hybrid striped bass are primarily pelagic feeders and typically forage heavily on gizzard shad populations where both species exist and shad are in good supply (Jahn et al. 1987). While hybrid striped bass stocking alone is not generally viewed as an adequate biological control to keep shad populations in check, the additional predation

pressure is likely to be a major contributor to the decline in the number of shad present in Nyona Lake (Dettmers et al. 1998).

While increased piscivore densities are the likely cause of shad declines at Nyona, the perceived effects of the decline appear to have improved survival and growing conditions for game fish in early life stages. Interspecific competition for prey resources occurs between abundant shad and other young fish populations such as bluegill and largemouth bass and can limit game fish growth and survival early in life. The reduction in shad likely reduced competition for prey resources thus improving early growth and survival of other species. Recruitment to stock-size has clearly increased for bass and bluegill populations since 1987 (Tables 3 and 5). While some of the gains in bass recruitment can be attributed to protection under the 12 and 14 inch minimum size limits, year classes for both species appear to be stronger and recruitment more consistent (Appendix).

Only one hybrid striped bass was collected during the 2010 standard survey. Hybrid striper stockings are evaluated biennially in the fall through targeted sampling with large-mesh gill nets to increase capture efficiency. In the 2007 and 2009 hybrid striped bass evaluation gill net CPUE was 23.6/lift and 5.3/ lift, respectively. These evaluations reveal that hybrid striped bass have survived and contributed to the quality of the fishery when stocked (Price 2006, Long 2008, Long 2010). Anecdotal evidence suggests that anglers frequently fish for and catch hybrid striped bass at Nyona. The stocking of hybrid striped bass at Nyona Lake should continue to provide increased predation pressure on shad and provide an additional game fish for anglers to target.

Bluegill relative abundance has increased dramatically from previous surveys (Table 2). The aforementioned improvements in recruitment have resulted in substantial gains in catch rates of stock and quality size bluegill (Table 5). Bluegill PSD lies within the range indicating balance, however growth RSD-P has declined since 1998. Catch rates for preferred-size bluegill ( $TL \geq 8.0$  in) remain unchanged.

Redear sunfish have historically comprised approximately fifteen percent of standard survey samples since 1980 yet declined to less than five percent in 2010. Most redear are generally collected in trap nets. Therefore, redear catch is closely tied to movements and can be quite variable depending on conditions at the time of the sample (Hubert 1996), especially when sampling effort is low and occurs in a short period of time. Trap net catch of redear in 2010 was

the lowest observed in three decades while electrofishing catch was the highest. These factors discount the likelihood of a major decline in redear abundance. However, trends in the population should continue to be monitored in future sampling efforts.

Yellow perch abundance is similar to the 1998 survey (5.3% in 2010 and 6.8 in 1998). The majority of fish collected in 2010 were age-2 perch and should provide good fishing over the next couple of years, as they become desirable size by anglers.

Overall, Nyona Lake is providing excellent fishing opportunities. Quality-sized largemouth bass and bluegill are now more abundant than previously measured. Additional quality fishing opportunities are offered by hybrid striped bass and redear sunfish. Yellow perch fishing should continue to improve over the next several years as a large year-class of 2-year-olds is recruited into the fishery.

Nyona Lake is currently scheduled to be sampled again in 2012 under the Glacial Lakes Status and Trends workplan. During this effort, trends in the community can continue to be monitored. While significant fishery survey work has been conducted at Nyona Lake over the past four decades, no creel surveys have been conducted. Valuation of this quality fishery as well as estimation of angler use of the stocked hybrid striped bass through an angler creel survey should be completed as soon as resources and priorities allow, ideally in 2012 in combination with the planned Status and Trends sampling effort.

#### RECOMMENDATIONS

- Continue yearly hybrid striped bass stocking at a rate of 10/acre (1,040 fish total).
- Estimate fishing effort and harvest at Nyona Lake as well as angler use of hybrid striped bass using an angler creel survey in 2012 or as soon as resources allow.

## LITERATURE CITED

- Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. pages 447-481 *in* B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2<sup>nd</sup> edition. American Fisheries Society, Bethesda, Maryland.
- Hubert W.A. 1996. Passive Capture Techniques. Pages 157-192 *in* B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2<sup>nd</sup> edition. American Fisheries Society, Bethesda, Maryland.
- IDNR. 2007. Tier II aquatic vegetation survey protocol. Indiana Department of natural Resources. Division of Fish and Wildlife. Indianapolis, Indiana.
- Jahn, L.A., D.R. Douglass, M.J. Terhaar, and G.W. Kruse. 1987. Effects of stocking hybrid striped bass in Spring Lake, Illinois. North American Journal of Fisheries Management 7:522-530.
- Long, C.C. 2008. Nyona Lake: Supplemental Hybrid Striped Bass Evaluation 2007. Indiana Department of Natural Resources. Division of Fish and Wildlife. Indianapolis, Indiana.
- Long, C.C. 2010. Nyona Lake: Supplemental Hybrid Striped Bass Evaluation 2009. Indiana Department of Natural Resources. Division of Fish and Wildlife. Indianapolis, Indiana.
- Price, J.D. 2006. Nyona Lake: Supplemental Hybrid Striped Bass Evaluation 2005. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, Indiana. 4 pp.
- Robertson, R. 1999. Nyona Lake fish management report 1998. Indiana Department of Natural Resources. Division of Fish and Wildlife. Indianapolis, Indiana.
- Shipman, S. T., E. Braun, D. Carnahan, L. Koza, B. Schoenung, D. Keller, D. Kittaka, and T. Stefanavage. 2001. Manual of fisheries survey methods. Indiana Department of Natural Resources. Division of Fish and Wildlife. Indianapolis, Indiana.

Submitted by: Jeremy Price, Fisheries Biologist

Approved by: Stu Shipman, Fisheries Supervisor  
Date: March 21, 2011

Table 1. Species stocked into Nyona Lake, Fulton County, Indiana.

Year	Species	Number	Mean length (in)
1971	Largemouth bass	100	
1986	Northern pike	550	8.50
1990	Hybrid striped bass	2,100	1.22
1991	Hybrid striped bass	2,004	1.30
1992	Hybrid striped bass	2,809	1.20
1993	Hybrid striped bass	1,040	0.93
1995	Hybrid striped bass	1,040	1.11
1997	Hybrid striped bass	2,080	1.05
1998	Hybrid striped bass	1,040	1.38
1999	Hybrid striped bass	1,040	1.43
2001	Hybrid striped bass	1,040	1.15
2002	Hybrid striped bass	1,040	1.66
2005	Hybrid striped bass	1,040	1.87
2006	Hybrid striped bass	1,040	1.23
2007	Hybrid striped bass	1,040	1.20
2009	Hybrid striped bass	1,075	1.25
2010	Hybrid striped bass	1,144	1.20

Table 2. Species relative abundance by percent number and weight (lbs.) with sampling effort for fisheries surveys from 1964 to 2010 at Nyona Lake, Fulton County, Indiana.

Species	<u>2010</u>		<u>1998</u>		<u>1987</u>		<u>1980</u>		<u>1973</u>	<u>1970</u>	<u>1964</u>
	Num. (%)	Wt. (%)	Num. (%)	Wt. (%)	Num. (%)	Wt. (%)	Num. (%)	Wt. (%)	Num. (%)	Num. (%)	Num. (%)
Bluegill	42.7	9.9	20.0	5.6	12.1	4.5	26.7	6.7	19.3	28.8	21.3
Largemouth bass	31.7	54.5	29.5	34.6	4.5	2.6	5.8	8.0	2.1	4.0	6.5
Gizzard shad	6.5	9.5	10.2	11.3	42.0	37.2	24.5	30.2	49.6	48.9	8.3
Spotted gar	5.4	12.0	6.1	8.1	3.2	10.0	1.6	6.9	1.1	2.4	0.2
Yellow perch	5.3	1.3	6.8	1.8	14.1	6.3	6.6	2.4	2.1	2.0	6.2
Redear sunfish	4.2	2.3	15.9	12.1	14.2	13.5	17.3	15.8	-	1.3	9.5
Black crappie	1.1	0.6	1.0	0.4	0.6	0.2	0.2	0.3	3.0	1.1	0.1
Yellow bullhead	0.8	1.3	-	-	-	-	-	-	0.2	0.2	0.8
Warmouth	0.6	0.3	1.4	0.5	0.5	0.2	2.0	0.5	0.2	0.2	5.9
Spotted sucker	0.5	0.7	-	-	0.4	0.9	1.0	0.8	1.2	0.9	0.9
Brown bullhead	0.5	1.4	3.7	7.6	0.8	2	1.6	3.3	1.2	2.4	0.5
White sucker	0.3	0.5	2.7	5.7	6.4	20.6	8.0	18.7	10.7	2.4	0.7
Longear sunfish	0.2	*	-	-	-	-	-	-	0.9	0.9	30.0
Hybrid striped bass	0.2	1.6	1.4	6.4	-	-	-	-	-	-	-
Common carp	0.2	4.2	1.0	5.8	0.1	0.6	-	-	-	0.2	0.2
Brook silverside	0.2	*	-	-	0.1	*	-	-	-	-	-
Pumpkinseed	-	-	0.3	0.1	0.6	0.2	0.4	*	0.8	0.2	7.7
Northern pike	-	-	-	-	0.2	0.2	0.2	0.9	0.2	1.1	-
Channel catfish	-	-	-	-	0.2	0.9	-	-	0.2	-	-
Golden shiner	-	-	-	-	0.1	*	2.0	0.9	0.3	0.9	0.3
Black bullhead	-	-	-	-	0.1	0.1	-	-	-	-	-
White crappie	-	-	-	-	-	-	1.6	1.8	6.6	1.1	0.0
Quillback	-	-	-	-	-	-	0.4	2.7	0.5	0.7	-
Hybrid sunfish	-	-	-	-	-	-	-	-	-	0.2	0.6
Lake chubsucker	-	-	-	-	-	-	-	-	-	-	0.2
Redfin pickerel	-	-	-	-	-	-	-	-	-	-	0.2
Longnose gar	-	-	-	-	-	-	-	-	-	-	*
Total	647 fish	319.90 lbs.	295 fish	206.84 lbs.	1,320 fish	656.15 lbs.	498 fish	265.79 lbs.	663 fish	452 fish	2,333 fish

\* Represents less than 0.1% of total

Gear	<u>Sampling Effort</u>						
	2010	1998	1987	1980	1973	1970	1964*
Electrofishing (h)	1.0 (DC)	1.0 (DC)	1.0 (DC)	1.0 (AC)	1.0 (AC)	1.0 (AC)	6.0 (AC)
Trap nets (lifts)	2	4	3	2	-	-	-
Gill nets (lifts)	4	2	3	2	2	2	12

\*Includes 68 wire trap lifts

Table 3. Largemouth bass electrofishing catch rates by size category from the 2010 standard fishery survey and two previous standard fishery surveys at Nyona Lake.

Size category	Largemouth Bass CPUE (Fish/hr)		
	1987	1998	2010
Stock (TL $\geq$ 8.0 in)	38	65	164
Quality (TL $\geq$ 12.0 in)	7	30	99
Preferred (TL $\geq$ 15.0 in)	3	7	9
Legal (TL $\geq$ 14.0 in)	3	11	37

Table 4. Population size structure indices for largemouth bass (LMB) and bluegill (BLG) from the from the electrofishing sample of the 2010 standard fishery survey and two previous standard fishery surveys at Nyona Lake.

Size structure index	1987	1998	2010	Balanced Range*
LMB - PSD	18	46	60	40 - 70
LMB - RSD-P	8	11	5	10 - 40
BLG - PSD	58	63	35	20 - 60
BLG - RSD-P	0	7	2	5 - 20

\* Anderson and Neumann 1996.

Table 5. Bluegill electrofishing catch rates by size category from the 2010 standard fishery survey and two previous standard fishery surveys at Nyona Lake.

Size category	Bluegill CPUE (Fish/hr)		
	1987	1998	2010
Stock (TL $\geq$ 3.0 in)	40	43	236
Quality (TL $\geq$ 6.0 in)	23	27	75
Preferred (TL $\geq$ 8.0 in)	0	3	4





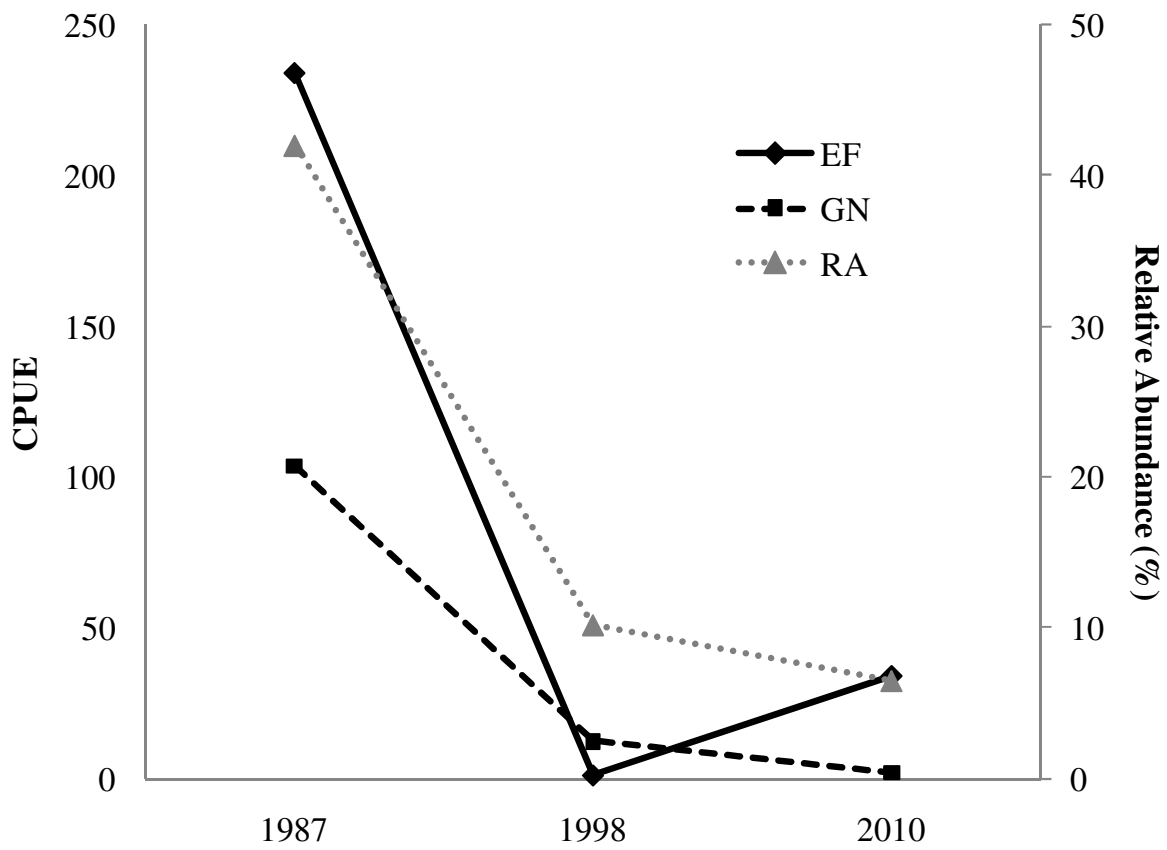


Figure 1. Catch-per-unit-effort from electrofishing and gill net catch shad and relative abundance for gizzard from standard fishery surveys of Nyona Lake from 1987 to 2010.

## APPENDIX

# LAKE SURVEY REPORT

Type of Survey

☐

Initial Survey

☒

Re-Survey

Lake Name	County	Date of survey (Month, day, year)
Nyona Lake	Fulton	7/5-7/8/10
Biologist's name	Date of approval (Month, day, year)	
Jeremy Price		

## LOCATION

Quadrangle Name	Range	Section
Macy	3E	10. 15, 16
Township Name	Nearest Town	
29N	Rochester	

## ACCESSIBILITY

State owned public access site		Privately owned public access site		Other access site	
Southwest corner					
Surface acres	Maximum depth	Average depth	Acre feet	Water level	Extreme fluctuations
104	32 ft	13 ft	1,334	793.91 MSL	1 '
Location of benchmark					
Located on bridge abutment over channel					

## INLETS

Name	Location	Origin
Fouts Ditch	North shore	
Whitmore	East shore	

## OUTLETS

Name	Location	
Mud Creek	Southwest shore	
Water level control		
Concrete dam with fixed spillway		
<b>POOL</b>	<b>ELEVATION (Feet MSL)</b>	<b>ACRES</b>
TOP OF DAM		
TOP OF FLOOD CONTROL POOL		
TOP OF CONSERVATION POOL		
TOP OF MINIMUM POOL		
STREAMBED		
<b>Bottom type</b>		
<input type="checkbox"/> Bolder		
<input type="checkbox"/> Gravel		
<input type="checkbox"/> Sand		
<input checked="" type="checkbox"/> Muck		
<input checked="" type="checkbox"/> Clay		
<input type="checkbox"/> Marl		

Watershed use
90% Agricultural; 10% Residential
Development of shoreline
70% Residential; 30% Natural
Previous surveys and investigations
Lake mapping: 1954.
Fisheries Surveys: 1964, 1966, 1970, 1973, 1980, 1987, 1998.
Hybrid striped bass evaluations: 1990, 1991, 2005, 2007, 2009.

### Occurrence and Abundance of Submersed Aquatic Plants - Overall

Lake: Nyona	Secchi (ft): 4	Mean species/site: 1.52
County: Fulton	Sites with plants: 32	SE Mean species/site: 0.19
Date: 7/21/2010	Sites with native plants: 31	Mean native species/site: 1.08
Littoral Depth (ft): 9.0	Number of species: 6	SE Mean natives/site: 0.14
Littoral Sites: 37	Number of native species: 5	Species diversity: 0.70
Total Sites: 50	Maximum species/site: 4	Native species diversity: 0.58

All Depths	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
Species		0	1	3	5	
Coontail	60.0	40.0	46.0	8.0	6.0	20.0
Eurasian water milfoil	44.0	56.0	40.0	4.0	0	10.4
Eelgrass	36.0	64.0	24.0	6.0	6.0	14.4
Chara	6.0	94.0	4.0	0	2.0	2.8
Largeleaf Pondweed	4.0	96.0	4.0	0	0	0.8
Small Pondweed	2.0	98.0	2.0	0	0	0.4

Filamentous Algae 68.0

Other species observed: Arrowhead, brittle naiad, bulrush, cattail, duckweed, purple loosestrife, sago pondweed, spatterdock, smartweed, watermeal, and white water lily

SAMPLING EFFORT					
ELECTROFISHING	Day hours		Night hours		Total hours
			1		1
TRAP NETS	Number of traps		Number of Lifts		Total effort
	2		2		4
GILL NETS	Number of nets		Number of Lifts		Total effort
	2		2		4
ROTENONE	Gallons	ppm	Acre Feet Treated	SHORELINE SEINING	Number of 100 Foot Seine Hauls

PHYSICAL AND CHEMICAL CHARACTERISTICS					
Color			Turbidity		
Brown			3 Feet		0 Inches (SECCHI DISK)
Alkalinity (ppm)*			pH		
Surface: 40		Bottom: 80	Surface: 9.5		Bottom: 8
Conductivity: 486 microsiemens			TDS: 1120		Air temperature: °F
Water chemistry GPS coordinates:			N 40.96447 W 86.18445		

TEMPERATURE AND DISSOLVED OXYGEN (D.O.)								
DEPTH (FEET)	Degrees (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)
SURFACE	83.1	13.2	36			72		
2	83.1	12.9	38			74		
4	83.1	12.5	40			76		
6	81.9	11.5	42			78		
8	78.4	5.9	44			80		
10	73.7	2.2	46			82		
12	68.2	1.0	48			84		
14	62.1	1.0	50			86		
16	60.7	1.0	52			88		
18	59.1	1.0	54			90		
20	56.7	1.0	56			92		
22	55.6	1.0	58			94		
24	54.8	1.0	60			96		
26			62			98		
28			64			100		
30			66					
32			68					
34			70					

COMMENTS

\*ppm-parts per million

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER AND WEIGHT					
*COMMON NAME OF FISH	NUMBER	PERCENT	LENGTH RANGE (inches)	WEIGHT (pounds)	PERCENT
Bluegill	276	42.7	1.8 - 8.2	31.68	9.9
Largemouth Bass	205	31.7	2.3 - 19.3	174.28	54.5
Gizzard Shad	42	6.5	1.4 - 16.5	30.43	9.5
Spotted Gar	35	5.4	18.6 - 31.0	38.46	12.0
Yellow Perch	34	5.3	4.2 - 9.5	4.13	1.3
Redear Sunfish	27	4.2	2.8 - 9.2	7.47	2.3
Black Crappie	7	1.1	4.4 - 10.5	1.83	0.6
Yellow Bullhead	5	0.8	7.5 - 12.3	4.03	1.3
Warmouth	4	0.6	3.4 - 8.0	0.91	0.3
Brown Bullhead	3	0.5	13.5 - 15.3	4.43	1.4
Spotted Sucker	3	0.5	9.7 - 16.2	2.25	0.7
White Sucker	2	0.3	11.1 - 13.5	1.45	0.5
Brook Silverside	1	0.2	3.6	0.01	0.0
Common Carp	1	0.2	31.5	13.44	4.2
Hybrid Striped Bass	1	0.2	21.2	5.04	1.6
Longear Sunfish	1	0.2	4.4	0.06	0.0
Total (15) Species	647			319.90	

\*Common names of fishes recognized by the American Fisheries Society.

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF BLUEGILL									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5	2	0.7	0.01	Not aged	19.5				
2.0	21	7.6	0.01	1	20.0				
2.5	17	6.2	0.02	1	20.5				
3.0	19	6.9	0.03	1, 2	21.0				
3.5	41	14.9	0.05	2	21.5				
4.0	44	15.9	0.07	2, 3	22.0				
4.5	19	6.9	0.09	2, 3	22.5				
5.0	12	4.3	0.12	2, 3	23.0				
5.5	21	7.6	0.15	3, 4	23.5				
6.0	30	10.9	0.19	3, 4	24.0				
6.5	22	8.0	0.23	3, 4	24.5				
7.0	18	6.5	0.28	4, 5, 6	25.0				
7.5	6	2.2	0.34	5, 6	25.5				
8.0	4	1.4	0.40	7	26.0				
8.5					TOTAL	276			
9.0									
9.5									
10.0									
10.5									
11.0									
11.5									
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	236.0 /h	GILL NET CATCH	1.5 /lift	TRAP NET CATCH	8.5 /lift
----------------------	----------	----------------	-----------	----------------	-----------

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF LARGEMOUTH BASS									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0	1	0.5	3.59	11
1.5					19.5				
2.0	1	0.5	0.01	Not aged	20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5	3	1.5	0.06	1	22.5				
5.0	5	2.4	0.08	1	23.0				
5.5	14	6.8	0.10	1	23.5				
6.0	4	2.0	0.13	1	24.0				
6.5	6	2.9	0.17	1	24.5				
7.0	6	2.9	0.20	1	25.0				
7.5	2	1.0	0.25	2	25.5				
8.0	5	2.4	0.30	2	26.0				
8.5	13	6.3	0.36	2	TOTAL	205			
9.0	13	6.3	0.42	2, 3					
9.5	11	5.4	0.49	2, 3					
10.0	11	5.4	0.57	2, 3					
10.5	5	2.4	0.65	2, 3					
11.0	4	2.0	0.74	3					
11.5	3	1.5	0.84	3, 4					
12.0	15	7.3	0.95	2, 3, 4					
12.5	14	6.8	1.07	3, 4					
13.0	10	4.9	1.20	3, 4, 5					
13.5	23	11.2	1.34	4, 5					
14.0	19	9.3	1.49	4, 5					
14.5	9	4.4	1.65	4, 5					
15.0									
15.5	3	1.5	1.99	4, 5					
16.0	3	1.5	2.18	6, 7					
16.5	1	0.5	2.39	7					
17.0									
17.5									
18.0									
18.5	1	0.5	3.32	8					

ELECTROFISHING CATCH	205.0 /h	GILL NET CATCH	0 /lift	TRAP NET CATCH	0 /lift
----------------------	----------	----------------	---------	----------------	---------



NUMBER, PERCENTAGE, WEIGHT, AND AGE OF GIZZARD SHAD									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0	1	2.4	0.00		19.0				
1.5	9	21.4	0.00		19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5					22.5				
5.0					23.0				
5.5					23.5				
6.0					24.0				
6.5					24.5				
7.0					25.0				
7.5					25.5				
8.0					26.0				
8.5					TOTAL	42			
9.0									
9.5									
10.0									
10.5									
11.0									
11.5									
12.0									
12.5									
13.0	3	7.1	0.76						
13.5	5	11.9	0.84						
14.0	14	33.3	0.93						
14.5	7	16.7	1.02						
15.0	2	4.8	1.12						
15.5									
16.0									
16.5	1	2.4	1.45						
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	34.0 /h	GILL NET CATCH	2.0 /lift	TRAP NET CATCH	0/lift
-------------------------	---------	-------------------	-----------	----------------	--------

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF YELLOW PERCH									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0	2	5.9	0.04	1	22.0				
4.5					22.5				
5.0	5	14.7	0.07	2	23.0				
5.5	8	23.5	0.08	2	23.5				
6.0	8	23.5	0.11	2	24.0				
6.5	3	8.8	0.13	2	24.5				
7.0	3	8.8	0.16	2, 3	25.0				
7.5	1	2.9	0.20	3	25.5				
8.0	2	5.9	0.23	3	26.0				
8.5	1	2.9	0.27	4	TOTAL	34			
9.0									
9.5	1	2.9	0.37	5					
10.0									
10.5									
11.0									
11.5									
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	33.0 /h	GILL NET CATCH	0.3 /lift	TRAP NET CATCH	0 /lift
-------------------------	---------	-------------------	-----------	----------------	---------

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF REDEAR SUNFISH									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5	1	3.7	0.02	Not aged	20.5				
3.0	1	3.7	0.03	Not aged	21.0				
3.5					21.5				
4.0					22.0				
4.5					22.5				
5.0	2	7.4	0.12	2	23.0				
5.5	7	25.9	0.16	2	23.5				
6.0	3	11.1	0.20	2	24.0				
6.5	1	3.7	0.24	2	24.5				
7.0	2	7.4	0.30	3, 4	25.0				
7.5	3	11.1	0.36	4	25.5				
8.0	2	7.4	0.43	4	26.0				
8.5	3	11.1	0.51	5, 6	TOTAL	27			
9.0	2	7.4	0.59	7					
9.5									
10.0									
10.5									
11.0									
11.5									
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									
ELECTROFISHING CATCH		25.0 /h		GILL NET CATCH	0 /lift		TRAP NET CATCH		0.5 /lift

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF BLACK CRAPPIE									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0	1	14.3	0.04	1	22.0				
4.5	3	42.9	0.05	1	22.5				
5.0					23.0				
5.5					23.5				
6.0					24.0				
6.5					24.5				
7.0					25.0				
7.5					25.5				
8.0					26.0				
8.5					TOTAL	7			
9.0									
9.5									
10.0	2	28.6	0.52	6, 7					
10.5	1	14.3	0.60	7					
11.0									
11.5									
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	7.0 /h	GILL NET CATCH	0 /lift	TRAP NET CATCH	0 /lift
----------------------	--------	----------------	---------	----------------	---------

AGE-LENGTH KEY FOR BLUEGILL														
LENGTH GROUP (inches)	NUMBER COLLECTED	NUMBER AGED	AGE											
			1	2	3	4	5	6	7	8	9	10	11	12
1.0														
1.5	2													
2.0	21	5	21											
2.5	17	5	17											
3.0	19	5	4	15										
3.5	41	5		41										
4.0	44	5		35	9									
4.5	19	6		13	6									
5.0	12	5		10	2									
5.5	21	5			8	13								
6.0	30	5			18	12								
6.5	22	5			4	18								
7.0	18	5				11	4	4						
7.5	6	5					4	2						
8.0	4	3							4					
8.5														
9.0														
9.5														
10.0														
10.5														
11.0														
11.5														
Total	276	64	42	114	48	53	7	6	4					
Mean TL			2.5	4.1	5.6	6.5	7.5	7.5	8.3					
SE			0.05	0.05	0.12	0.07	0.10	0.11	0.00					

AGE-LENGTH KEY FOR LARGEMOUTH BASS														
LENGTH GROUP (inches)	NUMBER COLLECTED	NUMBER AGED	AGE											
			1	2	3	4	5	6	7	8	9	10	11	12
1.0														
1.5														
2.0	1													
2.5														
3.0														
3.5														
4.0														
4.5	3	3	3											
5.0	5	4	5											
5.5	14	5	14											
6.0	4	4	4											
6.5	6	5	6											
7.0	6	5	6											
7.5	2	2		2										
8.0	5	5		5										
8.5	13	5		13										
9.0	13	5		10	3									
9.5	11	5		9	2									
10.0	11	5		7	4									
10.5	5	5		2	3									
11.0	4	4			4									
11.5	3	3			1	2								
12.0	15	6		8	5	3								
12.5	14	5			8	6								
13.0	10	5			6	2	2							
13.5	23	4				12	12							
14.0	19	4				10	10							
14.5	9	5				2	9							
15.0														
15.5	3	3				1	2							
16.0	3	3						2	1					
16.5	1	1							1					
17.0														
17.5														
18.0														
18.5	1	1								1				
19.0	1	1											1	
19.5														
20.0														
20.5														
21.0														
21.5														
Total	205	103	38	55	37	36	34	2	2	1			1	
Mean TL			6.1	9.6	11.7	13.6	14.2	16.3	16.5	18.8			19.3	
SE			0.12	0.17	0.22	0.15	0.10	0.00	0.25					

AGE-LENGTH KEY FOR YELLOW PERCH														
LENGTH GROUP (inches)	NUMBER COLLECTED	NUMBER AGED	AGE											
			1	2	3	4	5	6	7	8	9	10	11	12
1.0														
1.5														
2.0														
2.5														
3.0														
3.5														
4.0	2	2	2											
4.5														
5.0	5	3		5										
5.5	8	5		8										
6.0	8	5		8										
6.5	3	3		3										
7.0	3	3		1	2									
7.5	1	1			1									
8.0	2	2			2									
8.5	1	1				1								
9.0														
9.5	1	1					1							
10.0														
10.5														
11.0														
11.5														
12.0														
12.5														
13.0														
Total	34	26	2	25	5	1	1							
Mean TL			4.3	6.0	7.8	8.8	9.8							
SE			0.00	0.11	0.22									

AGE-LENGTH KEY FOR REDEAR SUNFISH														
LENGTH GROUP (inches)	NUMBER COLLECTED	NUMBER AGED	AGE											
			1	2	3	4	5	6	7	8	9	10	11	12
1.0														
1.5														
2.0														
2.5	1													
3.0	1													
3.5														
4.0														
4.5														
5.0	2	2		2										
5.5	7	5		7										
6.0	3	3		3										
6.5	1	1		1										
7.0	2	2			1	1								
7.5	3	3				3								
8.0	2	2				2								
8.5	3	3					2	1						
9.0	2	1							2					
9.5														
10.0														
10.5														
11.0														
11.5														
Total	27	22		13	1	6	2	1	2					
Mean TL				5.9	7.3	7.8	8.8	8.8	9.3					
SE				0.12		0.15	0		0					



AGE-LENGTH KEY FOR BLACK CRAPPIE														
LENGTH GROUP (inches)	NUMBER COLLECTED	NUMBER AGED	AGE											
			1	2	3	4	5	6	7	8	9	10	11	12
1.0														
1.5														
2.0														
2.5														
3.0														
3.5														
4.0	1	1	1											
4.5	3	3	3											
5.0														
5.5														
6.0														
6.5														
7.0														
7.5														
8.0														
8.5														
9.0														
9.5														
10.0	2	2						1	1					
10.5	1	1							1					
11.0														
11.5														
12.0														
12.5														
13.0														
13.5														
14.0														
Total	7	7	4					1	2					
Mean TL			4.6					10.3	10.5					
SE			0.13						0.25					

GILL NETS				TRAP NETS				ELECTROFISHING			
1	N	40.96076	W 86.18919	1	N	40.96704	W 86.18579	1	N	40.95965	W 86.18665
	N	40.95840	W 86.19006	2	N	40.95939	W 86.19026		N	40.96017	W 86.18664
2	N	40.95774	W 86.18850	3	N	40.96433	W 86.18725	2	N	40.96470	W 86.14833
	N	40.96083	W 86.18648	4	N	40.96082	W 86.18632		N	40.96415	W 86.18364
3	N	40.96392	W 86.18292					3	N	40.96797	W 86.18331
	N	40.96728	W 86.18269						N	40.96859	W 86.18332
4	N	40.96770	W 86.18510					4	N	40.96633	W 86.18552
	N	40.96433	W 86.18725						N	40.96595	W 86.18493